

Dogs, Pine Trees, and Carbs

Carbohydrates from a perhaps surprising source—pine trees—may have beneficial effects on dogs' digestive-system health, according to collaborative studies by Agricultural Research Service, university, and corporate scientists.

The carbs, predominantly a group known as “GGMOs”—short for galactoglucomannan oligosaccharides—are a key ingredient in Previda, an all-natural dietary ingredient marketed to makers of pet food, aquaculture feed, and other animal-nutrition products.

ARS chemist Neil P.J. Price began his studies of these fiber-rich carbs in 2007, working under the auspices of a cooperative agreement with Temple-Inland, a Texas-based producer of lumber, fiberboard, and other wood products made from loblolly, longleaf, and other kinds of pine trees often referred to as “southern yellow pine.”

GGMOs come into the spotlight in the latter stages of Temple-Inland's processing of the pine. When the trees are cut into lumber, wood chips remain. These are treated with heat, high pressure, and hot water to separate them into cellulosic fiber (for making fiberboard products) and hemicellulosic carbs—sometimes called “wood sugars”—which were the focus of Price's studies.

Temple-Inland had been selling the hemicellulosic mixture as a cattle-feed ingredient, and for other end uses, for about three decades before deciding to seek new ideas for value-added applications. In his laboratory at the ARS National Center for Agricultural Utilization Research in Peoria, Illinois, Price used proton magnetic resonance, mass spectrometry, and other analytical techniques to scrutinize the hemicellulosic carbs in samples from Temple-Inland's Diboll, Texas, operations.

His analyses, which at the time were apparently the most detailed of the hemicellulose mixture, pointed to the carbs' potential as a pet-food ingredient and paved the way for collaborative studies with a team led by George C. Fahey, Jr., a University of Illinois emeritus professor of animal sciences.

Studies Lead to New Pet-Food Ingredient

Today, hemicellulosic carbs from southern yellow pine make up 60 to 70 percent of Previda, a light-tan, fine-textured, spray-dried powder with a pleasant rum-and-raisin aroma.

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In one experiment, GGMOs from southern yellow pine were purified in Price's lab, then added, in place of dietary cellulose, to a high-quality kibble at the rate of 0.5, 1, 2, 4, or 8 percent. A control kibble contained no added GGMOs. The kibble was then fed to six healthy female dogs. Analyses of the dogs' fecal samples showed that increasing the percentage of pine GGMOs in the kibble was, in general, associated linearly with several significant indicators of a healthy lower digestive system.

“At some of these dietary concentrations, we saw an increase in populations of beneficial *Bifidobacterium* bacteria species, an increase in concentrations of short-chain fatty acids, and a decrease in pH,” says Fahey.

Hemicellulose extract, such as that in Previda, is already listed as a safe ingredient in a “gold-standard” registry maintained by the Association of American Feed Control Officials, a nonprofit organization that sets standards for the safety and quality of animal feed and pet food. The fact that no harsh chemicals are used in processing the wood chips from which Previda hemicellulosic carbs are extracted “is a further ‘plus’ for the safety of this product,” says Temple-Inland chemist Anne C. Hopkins.

Price, Hopkins, and Fahey, along with former University of Illinois animal sciences graduate student Trevor A. Faber and other collaborators, published their findings in the *Journal of Agricultural and Food Chemistry* in 2010 and 2011 and in the *Journal of Animal Science* in 2011.—By **Marcia Wood**, ARS.

This research is part of Quality and Utilization of Agricultural Products, an ARS national program (#306) described at www.nps.ars.usda.gov.

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Top photo: Chemist Neil Price prepares fraction samples collected by technician Trina Hartman for further analysis with a mass spectrometer. **Bottom:** Price analyzes sugars using a mass spectrometer to investigate which oligosaccharide sugars are present. The process involves several steps.